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Title: Validation and Calibration of the Actical Accelerometer in Preschool Children

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Decreased levels of physical activity are considered to have contributed to the increased prevalence of overweight and obesity in children. Measuring physical activity levels in young children is difficult due to lack of valid and acceptable methods. This paper reports on results of a study aimed to calibrate and validate the Actical accelerometer for use with preschool children aged 3-5 years.

Accelerometers provide information on the frequency, intensity and duration of activity in a tamper proof casing. Their limitations are they may not detect some non-weight-bearing activities and are unable to detect changes in intensity when moving up hill. The Actical accelerometer is the smallest available and water resistant. It has the added benefit of using an omnidirectional sensor that may capture activities not typically well assessed when using accelerometry as a measurement tool.

Eighteen preschool aged children (3-5 years) participated in this study to calibrate and validate the Actical accelerometer. The children were assessed over the course of three separate visits. Each child wore the Actical accelerometer and a Cosmod portable metabolic system during a period of rest; while performing three structured activities (for calibration); and during 20 minutes of unstructured indoor and outdoor activities at their pre-school (for cross validation). The calibration required children to attend a laboratory to perform the session of rest and structured activities. Children were visited in their preschools for the cross-validation to allow participation in indoor and outdoor unstructured activities.

The counts of the Actical accelerometer were highly correlated with oxygen consumption (VO_2) in the children while participating in structured weight bearing activity. The count cut-offs for both moderate and vigorous physical activity showed satisfactory sensitivity and specificity. There was also good agreement between intensity categories from the accelerometer counts and VO_2 while the children were participating in unstructured activity. This is important given that at this age, children participate in considerable unstructured activity.

In this study, accelerometer counts were collected in 15-sec intervals. The authors are confident that their cut-off points can be used for preschool aged children when data is collected at this interval. Smaller data collection intervals such as this are considered by many researchers to be useful in young children due to the sporadic nature of their movement.

There are limitations to this study which may impact on its generalisability. The count cut-off points are for preschool aged children using this accelerometer only and the sample size was relatively small. Additionally, the children participating in the study were predominantly African American. The authors note however that previous research has found no difference in accelerometer counts between African American and Caucasian children.

It is also difficult to make comparisons between this study and others. There have been few studies calibrating accelerometers in children and those that have been undertaken did not use the same measures or accelerometer. Studies that have used the Actical accelerometer have been conducted in older children or adolescents.

Overall, the findings suggest that the Actical accelerometer is a valid tool and provides an acceptable method of measuring physical activity in preschool aged children. However, there are some issues of cost in using such a device in intervention studies that usually involve larger sample sizes. Since it is likely that many studies will lack the necessary resources to administer accelerometers to children, accelerometer data can still be used as a direct method of validating observational or self-report physical activity questions (parental proxy report) in a sub-sample of the study population. Thus despite the prohibitive cost, the results of this study are relevant to those undertaking population based research, and it is worth considering by those implementing intervention programs with preschool aged children.